

Stress, Trauma and Sleep in Children

Avi Sadeh

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Synopsis: This chapter reviews the literature on the effects of trauma and stress on children's sleep patterns. Included are studies on "experimental stress", response to separation and loss, response to war and disasters and the consequences of child abuse. The importance of distinguishing between subjective and objective measures of sleep as well as the two basic modes of response of the sleep-wake system are highlighted.

Running Head: Stress, Trauma and Sleep

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Stress, Trauma and Sleep in Children

The relationship between stress and sleep is complex and multidimensional. To the extent that sleep and dreaming phenomena are sensitive to physiological and psychological stress, sleep, and sleep-related issues may arouse significant fears and anxieties in many children and thus represent a significant stressor in their lives. In addition, sleep disturbances and the resulting sleep loss or sleep deprivation and daytime fatigue and sleepiness can become a significant source of stress and require adaptational resources. The following review focuses only on the effects of stressful and traumatic experiences on sleep-wake patterns, summarizing the research and clinical literature in the field and outlining the theoretical and methodological issues that require additional research.

Defining Stress and Trauma

Stress and trauma are concepts used in both the medical and psychological literature to refer to unusual events, significant change or treat demanding special biobehavioral or psychological adaptive responses by the individual in order to maintain psychophysiological equilibrium and well-being. The stressor is the event that triggers the change or the threat. Despite many years of stress research, significant conceptual confusion still exists in the field.²¹ Selye,⁷⁴ who many consider to be the founder of the field of stress research, believed that the adaptive response to stress is composed of several common, non-specific components, regardless of the specific stressor. According to Selye the General Adaptive Syndrome (GAS) is characterized by: (1) the alarm phase, in which the activity of the adrenocortical system increases dramatically and facilitates hypervigilance, increased activity and readiness for action; (2) the stage of resistance which represents the organism's attempt to regain and maintain homeostasis; and (3) the stage of exhaustion, which results from a depletion of the adaptive energies and may cause irreversible damage to cardiovascular, digestive, immune, and circulatory systems. Within Selye's framework, atypical alternations in rest-activity cycles, hypervigilance, fatigue, and sleep-wake disorders represent non-specific components of the GAS.

The traumagenic or stressful effects of an event depend on multiple dimensions including: specific characteristics of the event (e.g., intensity, duration, predictability); the child's subjective perception and interpretation of the event; the child's resiliency and coping skills; and the child's support systems. These dimensions are determined, to a large extent, by the

child's age and developmental level. The way a 3-year-old boy perceives and responds to a ballistic missile attack on his country or an attempt to sexually abuse him differs dramatically from the way his 9-year-old brother would interpret the same event.

Sleep is very sensitive to transient as well as chronic aspects of the child's emotional status, expectations, anxieties, and psychopathology. Sleep disruptions appear in many psychiatric disorders and in some of the DSM-IV disorders sleep-related problems and derivatives are among the diagnostic criteria. Despite their relevance, the present review will not address the relationships between sleep and psychopathology (see Dahl and Puig-Antich,¹⁵ for a review).

Sleep in itself could be considered a stressor in many situations. Our ancestors believed sleep to be a death and the following awakening a rebirth. The interpretation of sleep as a final or total separation remains profound in human psychosocial organization throughout the life cycle. Going to sleep or falling asleep involves a series of processes that are potentially stressful, particularly to a young child. These processes include: discontinuation of daily activity and social contacts, darkness with its negative connotations related to "evil forces" (e.g., monsters, ghosts, criminal activity), experiences of loss of control associated with hypnagogic states or bodily functions (e.g., urine and bowel control). Needless to say, these fears are echoed and reinforced by different cultures using means such as myths, fairy tails, horror movies etc. The fusion of cultural myths and developmental issues is clearly seen in the phase-specific normal fears of sleep and darkness and in the nightmares so prevalent in kindergarten- and school-aged children.^{54,81}

"Experimental Stress" in Young Infants

Some common man-made manipulations or treatments are considered potential stressors. The effects of procedures such as circumcision, sleeping "wired" in a sleep lab, or routine treatment in an intensive care nursery on infant sleep have been examined in newborns and young infants.

Emde and colleagues²⁰ reported significant increases in the proportion of quiet sleep in healthy newborns following circumcision. They suggested that, in line with the conservation-withdrawal coping hypothesis, this increase in quiet sleep raises the stimulus barrier and protects the infant from additional external stimulation. Although these findings have been challenged,³ similar findings were reported by Gunnar, Malone and Fisch³³ who also documented relationships between changes in biobehavioral state and changes in cortisol levels and the operation of a sophisticated timing mechanism that coordinates the increase in quiet sleep and the decline of

cortisol levels. From a different angle, Sadeh, Dark and Vohr⁶⁸ found that newborns delivered by Caesarian section spent more time in active sleep during their first 2 days of life compared to those delivered vaginally. Similar findings were also reported by Freudigman and Thoman.³⁰ These findings could be interpreted as differences in infant sleep-wake patterns resulting from the different physiological stress associated with the two distinct types of delivery. Freudigman and Thoman also reported that newborns' day 1 sleep measures were more predictive of later development than those of day 2. The authors argued that day 1 measures best reflect the immediate neurobehavioral adaptational skills of the newborn to the new extrauterine stressful experience and thus predict later adaptation skills.

The idea that the individual will automatically protect himself or herself by shutting off external stimuli (sleep) thus increasing the barrier for stimulation in response to uncontrollable stress or trauma is not limited to infants. In two recent studies, one with holocaust survivors¹³ and the second with veterans diagnosed with war-related PTSD,⁴³ similar findings were obtained. When studied at home and in a sleep laboratory no evidence for insomnia or nightmares was found in either group. Higher levels of noise were required to awaken the PTSD veterans, compared to their controls. In comparison to their controls, well-adjusted holocaust survivors had significantly reduced dream recall upon induced REM awakenings, suggesting the operation of another automatic protective barrier during sleep.

Separation and Loss

Attachment and bonding are deep emotional and biological needs crucial for survival in both human and animals.^{8,9} Two of Bowlby's basic premises are particularly relevant here: (1) Any disruption of the attachment relationship can be experienced as a serious threat and cause significant distress for those who are in danger of losing a major source of security and support; and (2) Stress increases attachment needs and the search for attachment figures. The stress and trauma literature consistently supports these two premises.

Mother-Infant Separation

The stressful implications of separation from the primary caregiver have long been identified and documented. Spitz⁷⁷ described the maladaptive responses exhibited by young children and infants who were separated from their parents and raised in institutions. Their responses (e.g., loss of appetite, crying, apathy and withdrawal) which Spitz described as anaclytic depression

might have resulted from the poor social environment in those institutions (which Spitz termed “hospitalism”) and not merely from the separation response. Other similar consequences of separations have been described.^{8,62} Bowlby,⁸ who provided the theoretical framework for understanding the biological and survival value of attachment, distinguished between 3 phases of the separation response: (1) protest - the immediate stress reaction manifested in incessant loud crying, hypervigilance, acute distress and search for the missing caregiver; (2) despair - the child’s activity level decreases and is characterized by signs of withdrawal and helplessness; (3) detachment - the child interacts more readily with the new social environment and shows signs of recovery, but upon reunion with the primary caregiver the child appears detached and apathetic.

Some of the controlled studies in this field have been carried out using animal models, particularly monkeys. Monkeys separated from their mothers or their peers exhibited behaviors that highly resembled those of the human infant.^{44,57-59} Their initial response included increased agitation, motor activity and distress vocalizations, followed by a depressed reaction manifested by decreased activity and playfulness, and sleep disturbances characterized by increased wake time and number of arousals and decreased REM sleep. Other physiological changes in heart rate, body temperature and immune system response were also documented.

Field and colleagues studied the effects of short mother-child separation on the child’s biobehavioral functioning.^{25,26} When their mother was hospitalized for the birth of another child, young children exhibited significant increase in crying, negative affect, activity level, heart rate and night wakings. Another interesting sleep-related finding was that at this stage of separation from the mother, children’s sleep was characterized by longer periods of deep sleep. When the mother returned after a few days, the activity level, heart rate, active sleep and manifestation of positive affect decreased significantly. The authors interpreted these responses as signs of depression. They also considered their findings to be comparable to the biphasic response found in separation studies with primates: an immediate agitated response followed by a more persistent response of depression and helplessness.²⁶ In her second study,²⁵ Field investigated the cumulative effects of multiple mother-infant separations due to the mother’s professional activities (attending conferences). In contrast with earlier findings in monkeys, Field identified no negative cumulative effects to repeated separations.

Although the early literature has focused on the distress of the youngster in response to separation, the distress of the separating caregiver has also been recognized.^{38,39} From a clinical perspective, separation anxiety of both infant and parent, appears to play a major role in the

evolution and persistence of sleep disorders in young children.^{7,16,67} This bi-directional process is fueled by the practical and symbolic significance of the nocturnal separation within a culturally-determined expectation that the infant sleep alone. This separation may trigger protest from the infant (crying, clinging, refusal to stay in bed etc.), and fears and guilt feelings in the parent (usually more pronounced in the mother). This emotional interchange feeds into extended interactions around bedtime in which the parent becomes responsible for soothing the child to sleep and the child cannot acquire the self-soothing skills crucial for initiating and maintaining sleep.⁶⁷ Parental co-sleeping is often a forced solution which may reduce infant protests and improve infant sleep, but in many cases results in a new cosleeping habit that is unacceptable to the parents. Medoff and Schaefer⁵⁰ suggested, on the basis of their review of studies on traditional cosleeping (child sleeping in parents' bed), that cosleeping may temporarily suppress the child's sleep problem but cannot be considered a solution to the problem. In an intervention study, using objective sleep monitoring, time-limited parental sleep (e.g., for one week) in the infant's room was found effective in reassuring the infant and resolving his or her sleep problem.⁶⁵

Peer and Sibling Separation

As children grow, their early attachments to their primary caregivers are complemented by attachments to siblings and peers. Human and primate studies have shown that separation from peers constitutes a severe stressor for the youngsters.^{24,27,57,79} Common response patterns include agitated behavior and physiological changes resembling those found in studies of mother-infant separation.

In their study of nursery school infants and toddlers who graduated to new classes, Field and colleagues²⁴ reported increased fussing, verbal communication, physical contact, wandering and fantasy play in the week preceding and following the graduation in comparison to a baseline period. In the biobehavioral sphere the children's responses were characterized by increased activity level, longer sleep latency, increased crying prior to sleep onset and a decreased amount of sleep during naptime. No changes in sleep architecture (sleep states distribution) were documented. The authors noted the significance of anticipatory separation anxiety and the anticipatory biobehavioral reaction which was very similar to the reaction to the actual transition and separation. It is important to emphasize, however, that the transition to a new class involves many other significant issues besides peer separation. Other potential stressors includes

separation from significant adults (teachers), familiar environmental context and parental expectations and messages related to “growing up”.

There is sometimes a tendency to emphasize the role of separation issues in early childhood or in psychopathology and to neglect them in normal development of older children, adolescents and adults. However, these issues are issues for life that undergo many vicissitudes during the course of development.⁷⁸ The following case illustrates underlying separation issues and sleep in adolescence.

Linda, a 16 year-old adolescent, was referred to a sleep disorders center because of her complaints of inability to fall asleep. Linda reported that despite all her efforts she was unable to fall asleep before 4-5 AM when sunlight is already visible. However, despite her sleep difficulties, this well-adjusted and functioning student did not report any of the fatigue or daytime sleepiness that is usually associated with such complaints. Actigraphic home-monitoring revealed that some nights Linda needed between 30-40 minutes to fall asleep and on other nights she fell asleep almost instantly upon going to bed. However, on those nights she woke up around 4-5 AM and sustained a period of wakefulness that lasted between 20 and 40 minutes before she was able to resume sleep. In her recollection she connected this early morning waking problem with her difficulty to fall asleep. In the following interview it became apparent that the nights she fell asleep easily were characterized by visits of her older sister who had recently left the house due to her military duty. When her sister was visiting, the two of them, who were very emotionally attached, used to chat and enjoy each other's company until they fell asleep. However, on those nights when her sister was missing, Linda experienced some difficulties falling asleep or resuming sleep after the early morning waking. This newly gained understanding of her separation stress and a brief therapeutic intervention that included the acquisition of a relaxation technique resolved Linda's sleep problem. Linda adopted a new companion to her sleep initiation process: she left her radio turned on with an automatic shut off system.

This case illustrates that separation issues are issues for life that can affect sleep even in an otherwise well-adjusted and highly functioning adolescent. Interestingly, Mahon⁴⁷ reported a relationship between an increased sense of loneliness and reported sleep difficulties in adolescents.

Loss

The effects of loss of a significant other and the anticipatory or subsequent grief reaction are similar in many ways to effects of separation, particularly in very young children. Older children, with an established sense of self and object constancy can tolerate long separation without reacting to the separation as if it were an imminent loss. The literature on grief and bereavement in children lacks systematic studies of sleep-wake phenomena, although sleep problems have often been documented.^{35,36,51} Clinical cases are often more illustrative of the internal cognitive process the child is undergoing in his or her attempts to grasp the concept of death and to adapt to the loss of a significant other. From a psychoanalytic perspective, Shapiro⁷⁶ described a case of a 5-year-old girl who developed a sleep disturbance that was interpreted as a result of her attempt to incorporate the concept of death. Hancock³⁴ described a 3.5-year-old girl who suffered a severe sleep disturbance with an underlying unresolved grief reaction. Finally, Connell, Persley and Sturgess¹² described 6 children with a severe phobic reaction to sleep that was triggered by an encounter with the death of a relative or a close friend. The profound association between sleep and death appears to play a major role in the evolution and resolution of these clinical cases.

Post-Traumatic Stress Disorder

Dani, a 2.5 year-old boy, was referred to a sleep disorders laboratory because of severe sleep problems. Reportedly, Dani's sleep was very fragmented and accompanied by frequent nightmares, fears and crying. The parents reported that the onset of Dani's sleep disturbances followed a recent car accident in which he was seriously injured. The boy was left by his mother to play outside in the backyard of their house, shortly after which he ran into the street and was hit by a passing car. The boy was hospitalized with signs of minor concussion and released after a few days. However, Dani developed severe fears and separation anxiety. He was very phobic of any situation involving leaving home or going to the street. The parents reported multiple and prolonged night wakings with some vocalizations relating to the accident. The parents resorted to cosleeping with no identifiable benefits. Actigraphic assessment (sleep-wake assessment conducted with activity monitors) confirmed parental reports and indicated a very severe sleep problem. The diagnosis was that the child developed acute Post-Traumatic Stress Disorder and a focused, short-term psychotherapeutic intervention with the child and his parents was initiated. The child responded well to therapy and the parents reported significant improvement in his

sleep-related behavior. The severity of this boy's sleep disturbance illustrates to what extent an acute traumatic event can disrupt the sleep-wake system.

According to the DSM-IV,² sleep and dreaming disturbances are central to the diagnosis of Post-Traumatic Stress Disorders (PTSD). To be diagnosed with PTSD, the individual has to be exposed to a known traumatic event and experience severe threat of death, loss or injury and exhibit a fear response or agitated behavior. In addition, there is a list of persistent symptoms that serve as supplementary diagnostic criteria which include: recurrent distressing dreams of the event (nightmares), difficulty falling or staying asleep and hypervigilance. The ubiquitous involvement of sleep and dream phenomena in PTSD has led Ross and Colleagues, on the basis of the adult literature, to define sleep disorders as the hallmark of PTSD.⁶⁴

A major component of PTSD is hypervigilance or an increased level of arousal and agitation. There are a number of theoretical causal hypotheses to account for the concomitant appearance of hypervigilance and sleep difficulties in traumatized children: (a) hypervigilance is a biobehavioral adaptive response to imminent danger and therefore consolidated sleep (which represents the opposite behavior) would be a risky behavior from an evolutionary perspective; (b) sleep disruptions resulting from the traumatic events may lead to a paradoxical response of hypervigilance and agitation in sleep-deprived children; (c) there are separate neurobehavioral pathways by which sleep and hypervigilance are independently affected by stress.

The following sections include a brief review of the literature on the effects of PTSD and traumatic events on children's sleep.

Traumatic Experiences Associated with Child Abuse

One of the prevalent forms of traumatic experiences endured by many children is caused, most often, by their caregivers or familiar adults in the form of child abuse and neglect. Defining child abuse is a very difficult task in itself, and phenomena such as sexual, physical and emotional abuse are determined to a great extent by cultural norms. In modern Western societies sexual abuse is broadly defined as any sexual or sex-related activity occurring between a child and a person who is significantly older than the child. Physical abuse is much more difficult to define because any definition must exclude culturally-accepted corporal punishment. Other unacceptable means for inducing pain and intentional bodily harm to a child that include either the use of instruments, burning, unacceptable beating, hitting or physical restraints are usually

considered physical abuse. The neglect domain is even more resistant to definition and is usually applied when primary caregivers fail to reasonably meet minimal standards of child care such as feeding, health care, safety and availability.

Another barrier to the understanding of the consequences of child abuse is that in many cases the societal interpretation of the abusive interactions in which the child was involved are totally different from the child's own subjective experience. For instance, the child may experience some of the sexual activities as pleasant or stimulating rather than aggressive insults and violation of his or her body integrity.

Many adverse consequences of sexual and physical abuse have been documented in the literature. These negative effects could be broadly grouped into specific and non-specific categories. The specific consequences are those which are very consistent and repetitive and are conceptually related to the specific abuse. For example, sexually abused children are more likely to present inappropriate sexualized behaviors, such as repetitive and obsessive interest in sex-related activities and knowledge, seductive and promiscuous sexual behaviors.^{5,6,10} Physically abused children tend to present aggressive behaviors and victimize other children. In both domains of sexual and physical abuse the child tends to perpetuate the behaviors of either the perpetrator or the victim (e.g., by being revictimized or taking the role of the perpetrator). This strong specific tendency has been labeled "recycling the abuse".⁸⁷

The non-specific effects of child abuse appear less consistent and more age-dependent. Somatic and behavior disorders are more common in infants and younger children whereas internalizing disorders such as depression, anxiety, and low-self esteem and related disorders are more common in older children who have higher representational capacity. These symptoms are defined as non-specific because they have also been associated with many psychopathologies and etiologies unrelated to child abuse.

Among the non-specific effects, sleep disturbances appear to be the most prevalent response to child abuse, particularly sexual abuse.^{31,32,37,40,49,53,61,69,72} Young (1992) outlined the adverse effects of child abuse on body image, self-care behaviors and somatic phenomena. According to Young's theoretical framework, many of the somatic phenomena could be considered a turning against the self or one's own body after it has been violated by a perpetrator. In addition, many incidents of child abuse, and particularly sexual abuse, are directly related to being alone in bed or darkness. Moore,⁵³ in her review, suggested that sleep disturbances in

abused children may be related to their deep sense that sleeping is not a safe behavior and that they should stay alert and on guard at all times.

Most of these studies relied on parent reported sleep measures in the home setting. For example, Sadeh and Colleagues,⁶⁹ based on chart reviews, assessed sleep and other somatic issues in severely disturbed psychiatric inpatient children. Parents (or other primary care-givers) of sexually abused children reported more parasomnias than parents of physically abused or nonabused hospitalized children. When these children were observed on the hospital unit, the groups were indistinguishable, presenting only low frequencies of sleep-related difficulties. Interestingly, sexually abused children were also significantly smaller (short stature) than the other groups. The fact that growth hormone is mostly secreted during deep sleep stages raised the possibility that sleep disturbances mediate growth retardation in abused children, but this could not be supported directly by the findings.

In a subsequent study, Sadeh and colleagues⁷² assessed sleep in a similar cohort of severely disturbed hospitalized children on the inpatient unit with activity monitors (actigraphs) used for ambulatory sleep studies. In line with the previous findings, the children slept well on the unit, despite their severe behavioral problems and traumatic history. However, lower sleep percent (more fragmented sleep) was associated with the children's self-ratings of depression, hopelessness, low self-esteem and internalizing. These links between sleep problems and internalizing tendencies have also been reported by Fisher and Rinehart²⁸ in normal school-aged children, and by Dollinger,¹⁷ who concluded that sleep problems are mainly associated with behavior problems from the internalizing rather than the externalizing dimension of psychopathology.¹

Sadeh et al also found that as a group the physically abused children had the lowest means of sleep percent and quiet sleep percent measures compared to the other groups (no abused, sexual abuse, sexual and physical abuse). The lack of significant sleep problems on the unit in these children raises the important issue of the contextual factor in sleep studies of traumatized children. The authors suggested that hospitalized children experience the inpatient unit as a relatively secure shelter where they can sleep safely as opposed to their chronic need for hypervigilance in their natural environment.

War and Disaster Stress

Research aimed at understanding phenomena related to stress and trauma has often used natural or man-made disasters for field studies with multiple subjects exposed to similar stressors. Several of these studies reported sleep disturbances and nightmares as a frequent phenomena in survivors of war and disaster.

War

In their recent review on war-related stress in children, Jensen and Shaw⁴¹ indicated that there is conflicting and controversial literature on children's reactions to war-related stress. They suggested that children's cognitive immaturity and adaptive flexibility may mitigate the anticipated stressful effects. Another important issue is the actual proximity or level of direct exposure of the child to the disaster. When the issue of sleep is examined in the context of war-related stress, the findings are indeed conflicting.

Rofe and Lewin⁶³ reported that children living in an area subject to terrorist activities slept longer and had fewer bad dreams compared to children living in more secure areas. The authors suggested that children who are constantly exposed to war threats develop a repressive coping style. However, children exposed directly to a traumatic terror attack may find it difficult to adjust. Raviv and Klingman⁵⁶ investigated the aftermath of a terror attack in which 86 Israeli children were held hostage for 16 hours and that ended in a release operation where 22 were killed and 60 injured. In the follow-up evaluation three-quarters of the children suffered from persisting insomnia, nightmares and other psychosomatic problems.

One of the recent field studies on the effects of war-related stress was conducted by Lavie et al⁴⁵ who examined Israeli children's sleep during the Gulf War, when Israel was under attack by ballistic missiles. During the Gulf war, missile attacks carried both the threat of direct hit and destruction as well as the threat of chemical warfare. The civilian population was warned by an alarm signal (which preceded the actual hit by 1-5 minutes) and was instructed to prepare for chemical warfare by wearing gas masks and finding shelter in a sealed room. In addition, most of the attacks were launched during the night and were therefore directly associated with sleep. It was anticipated that sleep would be significantly disturbed under such stressful circumstances. In the first study, the sleep of 61 toddlers was assessed a few months prior to and a few days after the Gulf War using maternal reports. No significant changes in sleep habits or sleep quality were found. In the second study, actigraphic home-monitoring was used to assess the sleep of 55 school aged children during the war. Actigraphic recordings documented arousals that resulted

directly from discrete missile attacks, but the children were able to resume their sleep shortly after the attack with no evidence of carry-over effects. The authors were surprised by the remarkable resiliency of the children and found support in similar findings of adults who presented high prevalence of sleep-related complaints with no objective findings of any sleep disruption beyond the momentary arousals that resulted directly from the attacks and the alarm.⁴⁶

Disaster

Dollinger and colleagues^{18,19} studied the aftermath of a lightning-strike tragedy in which one child was killed and two were seriously injured during a soccer game. They reported significant sleep and somatic problems in many of the 29 children exposed to the traumatic event. The authors also reported significant correlations between the ratings of the emotional upset reaction to the event and specific sleep problems such as restless sleep, multiple awakenings, difficulty falling asleep, irregular bedtime and refusal to go to bed. These correlations may suggest that some of the more vulnerable children responded with generalized emotional upset, maladaptive behaviors and symptoms. When compared to normal controls on a fear survey, the survivors reported increased fear of storms with the second most distinct fear reported being related to sleep.

Sleep problems, particularly refusal to go to bed and sleeping alone, were the most frequent symptom (more than 50%) reported by parents following the Bay Area Loma Prieta earthquake. Similar findings were documented following the Hurricane Hugo disaster (summarized by Vogel and Vernberg⁸³). Considering the fact that many of these children also manifested separation difficulties, the specific sleep problems exhibited by these children could be interpreted as a fear of being alone or separation anxiety triggered or exacerbated by the disaster as also manifested by the children in these studies.

Pynoos and colleagues conducted a comprehensive study of 159 elementary school children after a fatal sniper attack on their school playground.⁵⁵ One child and a passerby were killed and 13 others were injured with many others caught under gunfire. Interestingly, Pynoos et al documented direct relationships between the PTSD reaction and the proximity and level of exposure to the event. Thus, 77.1% of the children who were on the playground during the attack reported sleep problems and 62.9% reported bad dreams compared with 55.6% of the children who were at school but not on the playground during the attack (that reported bad dreams and/or sleep problems) and much lower percentages in children who had left the school just prior to the

attack or were on a long vacation. Another interesting finding of this study was a factor composed of sleep disturbances, bad dreams, difficulties in concentration and intrusive thoughts, which suggests a significant relationship between reactive sleep disturbances and difficulties in daytime functioning.

In their large-scale survey of 5,687 school-aged children in South Carolina following Hurricane Hugo, Shanon and Colleagues,⁷⁵ assessed the epidemiology of posttraumatic symptoms. Girls were more likely than boys to report bad dreams (5.0 vs. 3.7 percent, respectively) whereas both sexes reported similar incidence of sleep difficulties (close to 20%). The incidence of reported sleep difficulties and bad dreams (as well as other somatic complaints) decreased with age, suggesting that young children are more susceptible to these developmental and/or reactive difficulties.

A Closer Look at the Relationship Between Stress and Sleep

The first strong impression from reviewing the literature on stress and trauma in children is that the sleep-wake system is the most prominent, nonspecific vulnerable system to succumb to a significant stressor. This impression is comprised of the ubiquitous reports on sleep difficulties as a short- and long-term consequence of diverse categories of stressors and traumatic events. A closer look raises the following conclusions and open issues:

1. Disruptions in sleep and dreaming are among the most common non-specific consequences of stress and trauma and exist alongside with the experience-specific consequences (e.g., fears of bad weather following a lightning-strike disaster, or sexualized behaviors following sexual victimization).
2. Most studies have documented sleep disruptions, increased sleep-related fears and parasomnias (particularly nightmares) in response to stressful and traumatic experiences (regardless of their specific nature). However, some studies have documented improved or deeper sleep following such experiences.
3. Most of the research in this field is based on subjective reports by parents or by the children themselves;
4. Most research reports do not specify distinct sleep problems (e.g., parasomnias versus refusal to go to sleep) although many do distinguish between sleep and dreaming phenomena;
5. The results are often inconsistent and conflicting. This is particularly true for studies employing objective techniques to assess sleep.

6. Anticipated or reported sleep difficulties are often not reflected in objective sleep measures.

From a theoretical standpoint there are two seemingly competing avenues for possible stress-related effects on sleep. On the one hand, there is the biobehavioral “turn-on” reaction: stress leads to increased anxiety, agitation, vigil, activation of the sympathetic adrenergic system and results in difficulties initiating and maintaining sleep and possibly also in stress-related parasomnias, particularly nightmares. On the other hand, coping with stress and/or failure to regain prior state of well-being, may lead to the “shut-off” reaction -- a systematic withdrawal and turning away from external and internal stimuli by significantly decreasing activity level and extending and deepening sleep. These two opposite tendencies could possibly account for many of the conflicting or paradoxical findings in this field.

These “turn-on” and “shut-off” reactions documented in sleep as a response to stress are consistent with the natural course of stress reaction as seen in animal studies. The first phase of the stress reaction is usually increased agitation, increased activity level, protest and struggle to regain control -- compatible with the “turn on” -- which is replaced by a stage of decreased activity, withdrawal, and signs of depression or helplessness. These findings have been explained by the conservation-withdrawal hypothesis.^{20,22,48}

These biobehavioral “turn-on” and “shut-off” reactions are also consistent with other perspectives on childhood trauma. One of the crucial factors in determining the effects of traumatic stress is its severity and time course. The literature suggests that acute and chronic stress may result in distinct manifestations. Terr,⁸⁰ in her outstanding analysis of childhood trauma, distinguished between two types of traumatic experiences: (1) Type I traumatic experience resulting from a single, sudden blow; and (2) Type II traumas resulting from long-standing or multiple traumatic ordeals. One of the distinctions between Type I and Type II traumatic experiences is that whereas Type I is characterized by fully-detailed memories of the events and a stronger sense of specific fears and vigilance that are compatible with the “turn-on” reaction, Type II experiences lead to denial and psychic numbing, self-hypnosis and dissociation that are compatible with the “shut-off” reaction.

When studying sleep phenomena under presumably stressful conditions it is crucial to obtain some subjective measures of how the stressor is perceived and interpreted by the child. Such an inquiry enables better understanding of the mechanisms mediating stressful situations, stress reactions and sleep-wake phenomena.

Another issue with important implications is that children's sleep is particularly context-dependent and that children studied in a relatively safe and relaxed environment (e.g., sleep laboratory or hospital setting) may sleep well despite the fact that their sleep is indeed disturbed in stressful environments (an abusive or otherwise stressful home environment). Subjective and parental knowledge about sleep patterns are limited and could be distorted by expectations and beliefs.^{65,66} Naturalistic studies would therefore benefit from objective assessment of the sleep phenomena under stressful conditions. A tendency to exaggerate stress-related sleep and dreaming phenomena may exist because the connection has become common knowledge or is expected.

An additional issue that has escaped thorough investigation is the issue of individual and developmental differences. Although these aspects have been emphasized and implied again and again in the stress literature in the contexts of sensitivity and reactivity to stress, appraisal of stressors, coping mechanisms, and age-related vulnerability, they have rarely been the focus of a sleep-related study.^{4,42} A number of studies have suggested that children who develop sleep disturbances possess some specific temperamental or biobehavioral characteristics that make them particularly vulnerable in this domain.^{11,28,71,73,82,84,85,89} Lower sensory threshold (increased reactivity) is one of the characteristics that could account for increased likelihood to develop disordered sleep.^{11,71} Fisher and Rinehart²⁸ have found significant relationships between children's physiological reactivity and arousal level (cortisol levels and skin conductance) in response to an experimental stressor (Stroop test) and manifestations of parasomnias as reported by their parents. Their study suggests a possible stress-related physiological susceptibility in children with reported parasomnia. As reported above, some post-disaster studies have shown age-related trends (e.g., reporting that younger children suffer more sleep difficulties than older children). However, these findings do not necessarily reflect stress-related developmental trends in light of the fact that these trends have been identified in normative studies.⁶⁰

From a clinical perspective, there are many indications that stress can evoke sleep difficulties in children. Moreover, children who have been treated and their sleep problems resolved, are still vulnerable to relapse in stressful situations.^{16,23,67} The basic individual biobehavioral features that make a certain child prone to develop a sleep disorder, the mechanisms by which this vulnerability turns into an actual sleep disturbance, and the role of stress in this process is yet to be systematically explored and understood.

The present chapter did not address another significant issue -- the role of sleep disorders as stressors at the individual and family level. Sleep disorders can lead or be linked to significant psychopathology^{14,15,29,69,70,72} and the resolution of a sleep disorder can sometimes resolve the related psychopathology and lead to great relief in the family.^{14,52,86} Moreover, this chapter did not address the effects of daily stressors and hassles (e.g., academic performance, social issues) on children's sleep. All of these unexplored territories and methodological issues emphasize the need for more experimental exploration that could potentially promote our understanding beyond the correlative studies so common in this field.

References

1. Achenbach TM, Edelbroch S: The classification of child psychopathology: A review and analysis of empirical efforts. *Psychol Bull* 85:1275-1301, 1978
2. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Washington: American Psychiatric Association, 1994
3. Anders TF, Chalemian RJ: The effects of circumcision on sleep-wake states in human neonates. *Psychosom Med* 36:174-179, 1974
4. Arnold E (ed.): Childhood Stress. New York: John Wiley & Sons, Inc. 1990
5. Beitchman JH, Zucker KJ, Hood JE, et al: A review of the long-term effects of child sexual abuse. *Child Abuse Negl* 16:101-118, 1991
6. Beitchman JH, Zucker KJ, Hood JE, et al: A review of the short-term effects of child sexual abuse. *Child Abuse Negl* 15:537-556, 1991
7. Benoit D, Zeanah C, Boucher C, Minde K: Sleep disorders in early childhood: Association with insecure maternal attachment. *J Am Acad Child Adolesc Psychiatry* 31:86-93, 1992.
8. Bowlby J: *Attachment and Loss. Vol 1. Attachment.* London: Hogarth, 1969
9. Bowlby J: *Attachment and Loss. Vol 2. Separation Anxiety and Anger.* New York: Basic Books, 1973
10. Browne A, Finkelhor D: Impact of child sexual abuse: a review of the research. *Psychol Bull* 99:66-77, 1986
11. Carey WB: Night-waking in infants and temperament in infancy. *J Pediatr* 84:756-758, 1974
12. Connell HM, Persley GV, Sturgess JL: Sleep phobia in middle childhood: A review of six cases. *J Am Acad Child Adolesc Psychiatry* 26:449-452, 1987

13. Dagan Y, Lavie P, Bleich A: Elevated awakening thresholds in sleep stage 3-4 in war-related post-traumatic stress disorder. *Biol Psychiatry* 30(6): 618-622, 1991
14. Dahl RE, Pelham WE, Wison M: The role of sleep disturbances in attention deficit disorder symptoms: a case study. *J Pediatr Psychol* 16:229-239, 1991
15. Dahl RE, Puig-Antich J: Sleep disturbances in child and adolescent psychiatric disorders. *Pediatrics* 17:32-37, 1990
16. Daws D: *Through the Night: Helping Parents and Sleepless Children*. London: Free Association Books.
17. Dollinger SJ: Childhood sleep disturbances. *Advances Clin Child Psychol* 9:279-332, 1985
18. Dollinger SJ, O'Donnell, Staley AA: Lightning-strike disaster: effects on children's fears and worries. *J Consult Clin Psychol* 52:1028-1038 1984
19. Dollinger SJ: The measurement of children's sleep disturbances and somatic complaints following a disaster. *Child Psychiat Hum Dev* 16:148-153 1986
20. Emde RH, Harmon R, Metcalf D, et al: Stress and neonatal sleep. *Psychosom Med* 33:491-497, 1971
21. Engel BT: Stress is a noun! No, a verb! No, an adjective! In Field TF, McCabe PM, Schneiderman N: *Stress and Coping*, Hillsdale, New Jersey, Lawrence Erlbaum Associates, 1985
22. Engel GL, Schmale AH: Conservation-withdrawal: A primary regulatory process for organismic homeostasis. In *Physiology, Emotion and Psychosomatic Illness*. Amsterdam: Elsevier, 1972
23. Ferber R: *Solve Your Child's Sleep Problems*. New York: Simon & Schuster, 1985
24. Field T: Peer Separation of children attending new schools. *Develop Psychol* 20:786-92, 1984
25. Field T: Young children's adaptations to repeated separations from their mothers. *Child Develop* 62, 539-547, 1991
26. Field T, Reite M: Children's responses to the separation from mother during the birth of another child. *Child Develop* 55:1308-1316, 1984
27. Field T, Vega-Lahr, Jagadish S: Separation stress of nursery infants and toddlers graduating to new classes. *Infant Behav Develop* 7:277-284, 1984

28. Fisher BE, Rinehart S: Stress, arousal, psychopathology & temperament: a multidimensional approach to sleep disturbances in children. *Person Individ Diff* 11:431-438, 1990
29. Ford DE, Kamerow DB: Epidemiologic Study of sleep disturbances and psychiatric disorders: An opportunity for prevention? *J Am Med Assoc* 262:1479-1484, 1989
30. Freudigman KA, Thoman E: Infant sleep during the first postnatal day: an opportunity for assessment of vulnerability. *Pediatrics* 92:373-379, 1993
31. Goldston DB, Turnquist DC, Knutson JF: Presenting problem of sexually abused girls receiving psychiatric services. *J Abn Psychol* 98:314-317, 1989
32. Goodwin J: Post-traumatic symptoms in abused children. *J Traumatic Stress* 1:475-488. 1988
33. Gunnar MR, Maone S, Fisch RO: The psychobiology of stress and coping in the human neonate: Studies of adrenocortical activity in response to aversive stimulation. In Field TF, McCabe PM, Schneiderman N: *Stress and Coping*, Hillsdale, New Jersey, Lawrence Erlbaum Associates, 1985
34. Hancock E: The case of Ann: A sleep disturbance in a 3-year-old child. *Social Work Health Care* 3:243-255, 1978
35. Harris ES: Adolescent bereavement following the death of a parent: An exploratory study. *Child Psychiatry Hum Develop* 21:267-281, 1991
36. Herzog JM: Sleep disturbances and father hunger in 18- to 28-month-old boys: The Erlkonig syndrome. *Psychoanal Study Child* 35:219-233, 1980
37. Hillary BE, Schare ML: Sexually and physically abused adolescents: an empirical search for PTSD. *J Clinical Psychol* 49: 161-165, 1993
38. Hinde RA, McGinnis L: Some factors influencing the effects of a temporary mother-infant separation: Some experiments with rhesus monkeys. *Psychol Med* 7:197-212, 1977
39. Hock E, McBride S, Gnezda MT: Maternal separation anxiety: mother -infant separations from the maternal perspective. *Child Develop* 60:793-802, 1989
40. Hudson, PS: Ritual child abuse: a survey of symptoms and allegations. Special Issue: In the shadow of the Satan: The ritual abuse of children. *J Child Youth Care Spec Issue*: 27-53, 1990.
41. Jensen PS, Shaw J: Children as victims of war: current knowledge and future research needs. *J Am Acad Child Adolesc Psychiatry* 32:697-708, 1993

42. Kagan J: Stress and coping in Early Development. In N Garnezy & M. Rutter (Eds.) *Stress, Coping and Development in Children*. New York: McGraw-Hill, 1983
43. Kaminer H, Lavie P: Sleep and dreaming in Holocaust survivors. Dramatic decrease in dream recall in well-adjusted survivors. *J Nerv Ment Dis* 179:664-669, 1991
44. Laudenslager ML, Reite M, Hadbeck R: Suppressed immune response in infant monkeys associated with maternal separation. *Behav Neural Biol* 36:40-48, 1982
45. Lavie P, Amit Y, Epstein R, et al: Children's sleep under the threat of attack by ballistic missiles. *J Sleep Res* 2:34-37, 1993
46. Lavie P, Carmeli A, Merorach L, et al: To sleep under the threat of the Scud: characteristics of war-related insomnia. *Is J Med Sci* 27:681-686, 1991
47. Mahon NE: Loneliness and sleep during adolescence. *Percept Motor Skills* 78:227-231, 1994
48. McCabe P, Schneiderman N: Psychophysiological reactions to stress. In N. Schneiderman & J. Tapp (Eds.). *Behavioral Medicine: The biopsychosocial Approach*. Hillsdale, NJ: Erlbaum, 1984
49. Mead JM, Mead NE: Postmolestation regression in children. *Am J Psychiatry* 143:559, 1986
50. Medoff D, Schaefer C: Children sharing the parental bed: a review of the advantages and disadvantages of cosleeping. *Psychology J of Hum Behav* 30:1-9, 1993
51. Meshot CM, Leitner LM: Adolescent mourning and parental death. *Omega J Death Dying* 26:287-299, 1993
52. Minde K, Faucon A, Falkner S: Sleep Problems in toddlers: Effects of treatment on their daytime behavior. *J Am Acad Child Adolesc Psychiatry* 33:1114-1121, 1994
53. Moore MS: Disturbed attachment in children: a function in sleep disturbance, altered dream production and immune dysfunction. Not safe to sleep: Chronic sleep disturbances in anxious attachment. *J Child Psychotherapy* 15:99-111, 1989
54. Nagera H: Sleep and its disturbances approached developmentally. *Psychoanalytic Study Child* 21:393-447, 1966

55. Pynoos RS, Frederick C, Nader K, et al: Life threat and posttraumatic stress in school-age children. *Arch Gen Psychiatry* 44:1057-1063, 1987
56. Raviv A, Klingman A: Children under stress. In: Stress in Israel, ed. S Breznitz. New York: Van Nostrand Reinhold Company, pp. 138-162, 1983
57. Reite M, Harbeck R, Hoffman A: Altered cellular immune response following peer separation. *Life Sciences* 29:1133-6, 1981
58. Reite M, Short R, Kaufman IC, et al: Heart rate and body temperature in separated monkey infants. *Biolog Psychiatry* 13:91-105, 1978
59. Reite M, Snyder DS: Physiology of maternal separation in a bonnet macaque infant. *American Journal of Primatology* 2:115-120, 1982
60. Richman N: (1987). Surveys of sleep disorders in children in a general population. In C. Guilleminault (Ed.) *Sleep And Its Disorders in Children*. New York: Raven Press.
61. Rimsza ME, Berg RA, Locke C: Sexual abuse: somatic and emotional reactions. *Child Abuse Negl* 12:201-208, 1988
62. Robertson J, Robertson J: Young children in brief separation. *Psychoanal Study Child* 26: 264-315, 1971
63. Rofe Y, Lewin I: The effect of war environment on dreams and sleep habits. In: *Stress and Anxiety*, Vol. 8, eds C.D. Spielberger, I.G. Sarason & N.A. Milgram. Washington DC: Hemisphere, pp 59-75, 1982
64. Ross RJ, Ball WA, Sullivan KA, Caroff SN: Sleep disturbances as the hallmark of Posttraumatic Stress Disorder. *Am J Psychiat* 146:697-707, 1989
65. Sadeh A: Assessment of intervention for infant night waking: parental reports and activity-based home monitoring. *J Consult Clinic Psychol* 62:63-98, 1994
66. Sadeh A: Evaluating Night-Wakings in Sleep-Disturbed Infants: Methodological Study of Parental Reports and Actigraphy? *Sleep*, in press.
67. Sadeh A, Anders TF: Infant sleep problems: origins, assessment, intervention. *Infant Mental Health J* 14: 17-34, 1993
68. Sadeh A, Dark I, Vohr BR: Newborns' sleep-wake patterns: The role of maternal, delivery and infant factors. *Early Hum Develop* in press.

69. Sadeh A, Hayden RM, McGuire J, et al: Somatic, cognitive and emotional characteristics of abused children hospitalized in a psychiatric hospital. *Child Psychiat Hum Dev* 24, 191-200, 1994
70. Sadeh A, Klitzke M, Anders TF, et al: Sleep and Aggressive Behavior in a Blind Retarded Adolescent: A Concomitant Schedule Disorder? *J Am Acad Child Adolesc Psychiatry* 34:820-824, 1995
71. Sadeh A, Lavie P, Scher A: Maternal perceptions of temperament of sleep-disturbed toddlers. *Early Educ Develop* 5:311-322, 1994
72. Sadeh A, McGuire JPD, Sachs H, et al: Sleep and psychological characteristics of children on a psychiatric inpatient unit. *J Am Acad Child Adolesc Psychiatry* 34:813-819, 1995
73. Schaefer CE: Night waking and temperament in early childhood. *Psychological Report*, 67:192-194, 1990
74. Selye H: *The Stress of Life*, New York: McGraw-Hill, 1956
75. Shannon MP, Lonigan CJ, Finch AJ, Taylor CM: Children exposed to disaster: I. Epidemiology of post-traumatic symptoms and symptoms profiles. *J Am Acad Child Adolesc Psychiatry* 33:80-93, 1994
76. Shapiro T: The unconscious still occupies us. *Psychoanal Study Child* 38:547-567, 1983
77. Spitz R: Anaalytic depression. *Psychoanal Study Child* 2:113-117, 1946
78. Stern D: *The Interpersonal World of the Infant: A View From Psychoanalysis and Developmental Psychology* New York: Basic Books, 1985
79. Suomi SJ, Collins HL, Harlow HF: Effects of maternal and peer separation on young monkeys. *J Child Psychol Psychiatry* 17:101-112.
80. Terr LC: Childhood traumas: An outline and overview. *Am J Psychiatry* 148:10-12, 1991
81. Terr LC: Nightmares in children. In: C. Guilleminault (Ed.) *Sleep And Its Disorders in Children*. New York: Raven Press.
82. Van Tassel EB: The relative influence of child and environmental characteristics on sleep disturbances in the first and second year of life. *J Develop Behav Pediatrics*, 6: 81-86, 1985
83. Vogel JM, Vernberg EM: Children's psychological responses to disasters. *J Clin Child Psychol* 22:464-484, 1993
84. Weissbluth M, Davis T, Poncher J: Night waking in 4- to 8-month-old infants. *J Pediatrics* 104:477-480, 1984

85. Weissbluth M, Liu K: Sleep Patterns, attention span and infant temperament. *Develop Behavioral Pediatrics* 4:34-36, 1983
86. Wolfson A, Lacks P, Futterman A: Effects of parent training on infant sleeping patterns, parents' stress, and perceived parental competence. *J Consult Clinic Psychol* 60:41-48, 1992
87. Wyatt GE, Gutrie D, Notgrass CM: Differential effects of women's child sexual abuse and subsequent sexual revictimization. *J Consult Clin Psychol* 60:167-173. 1992
88. Young L: Sexual abuse and the problem of embodiment. *Child Abuse Negl* 16:89-100, 1992
89. Zuckerman B, Stevenson J, Baily V: Sleep problems in early childhood: Continuities, Predictive factors, and behavioral correlates. *Pediatrics* 80:664-671, 1987